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THE TEACHING OF HYGIENE AND SANITARY SCIENCE IN THE SECONDARY SCHOOLS[1]

AT the last meeting but one of the Schoolmasters' Club I presented a "Plea for the Teaching of Sanitary Science in our Public Schools," and in the college section of the State Teachers' Association a similar one, the special plea at this time being for the teaching of this science in our colleges and higher institutions of learning. The first of these papers has since been published in the January number of *Education*, and the second one may be found in the published proceedings of the state association. From the fact that a request has now come for a further consideration of this subject I am pleased to believe that in several important particulars we have reached settled conclusions. We are all coming to a just appreciation of what sanitation will do, that it will be the means of incalculable good to the citizens of our state, that the claims which sanitarians make of the good already being accomplished are true and well founded, that with the present conditions and workings of the health administration very many lives are saved each year, that this good work can largely be augmented by the intelligent coöperation of all the people, and that, therefore, we, as educators, are justified in giving this subject a place in our course of study. The past two years have witnessed a very great willingness on the part of the teachers of Michigan to enter heartily upon this work. The state board of health has

[1] Proceedings of the Michigan Schoolmasters' Club.

been taxed to the full extent of its appropriations in order to supply the literature asked for by those who are paying special attention to this subject in their schools. It would thus seem that the two systems of public health and public education are henceforth to be intimately associated, the one aiding the other, and that the knowledge of how to preserve the body in the full possession of all its powers and for the greatest number of years "shall be taught in every school to every pupil," to the end that the legitimate work of the schools, the training of the mental and moral faculties, may proceed with the most certain success.

It has been urged that for the study of hygiene, as it has been carried on in the past, there shall be substituted sanitary science, and that its practical application in the schools should have regard to those causes which produce severe sickness and untimely deaths rather than those sanitary or hygienic sins which merely produce temporary discomfort. And just here is found our first general answer to the question, What shall be taught? namely, teach those facts and principles which have for their end the far-reaching and beneficent result of preventing sickness and premature death. To use a concrete example as an illustration of the principle, do not spend the time allotted to this subject in teaching the errors of diet, eating too much or too rich food at late hours or between meals, if that is to take the place of teaching the method by which the spread of sickness and death from scarlet fever is prevented. This work is important, and yet it is true that comparatively few die from errors of diet, while many die from scarlet fever, diphtheria, and other communicable diseases. To be sure, there are factors which concern health only a little less potently than those agencies which directly produce disease and death, and some consideration of these should find a place in every course in sanitary science. Such are the subjects of water supply and ventilation.

A second general answer to the first of the three inquiries, what to teach, is one applicable to all new subjects, and yet one not thoroughly appreciated by teachers. Every new subject has its technical terms, its peculiar language, its dialect, if you

please, and this is peculiarly true of sanitary science. This language must be learned, its technical terms mastered, defined, translated, and put into practical use. For example, suppose I read the statement in the daily paper that "In February last an outbreak of diphtheria occurred in Blank township which rapidly became epidemic, owing to the failure of certain physicians to correctly diagnose the first cases. Proper precautions are now being carried out, all exposed persons are promptly isolated, the premises placarded, and the rules regarding isolation of the patient and thorough disinfection of all articles which have become infected are rigidly enforced." In the brief statement occur several technical terms which are peculiar to this subject, such as "outbreak," "epidemic," "diagnose," "proper precautions," "placarded," "isolations," "disinfection," "infected." Pupils should be taught to use these words clearly aud intelligently. They should also be taught to "read between the lines" and to verify, by some work of their own, such statements as will admit of this treatment.

For example, suppose I read the statement that "In greater London 2082 deaths were registered during the week ending December 5, 1896, corresponding to an annual death rate of 17.6 per thousand of the population." Let the pupil ask and answer the questions: What is the population of greater London? What is the total annual mortality of that city? Notice that the object here is not to ascertain the population of greater London, but rather to scrutinize the statement that its meaning may be clearly apprehended and that a habit of thus testing such state ment shall be inculcated. Take another example : The reports of the supervising surgeon-general, United States marine-hospital service (who is he and what are his duties?), for the month of November 1896, show that in Minneapolis, with an estimated population of 192,833, there were 150 deaths ; in Buffalo, with an estimated population of 350,000, the total deaths were 309, and in Cleveland, estimated population of 330,279, total deaths were 346. These statements of themselves convey little, if any, significant or intelligent information. Are these rates high or

low? How do they compare with each other? How do they compare with the state of Michigan? With the town in which I live? We have not done our duty by them when we have merely pronounced the words or read the sentences; they must be digested, assimilated, transformed, compared. Let the teacher and pupil, therefore, cultivate the habit of answering the numerous questions which are raised by such statements. Compare the three cities named as to healthfulness. Find statistics, if possible, of your own town and make comparisons with the above. What would have been the total annual mortality in your own town at the rate shown above for Buffalo? How many people died in the state of New York during the year 1896, if the death rate for the whole state was the same as that shown above for Buffalo? How many in Michigan at the same rate? etc.

It has been my purpose to give at this time a more specific and detailed answer to the question: What shall we teach? but this cannot be done until we have determined the proper answer to the How much and the How? From some standpoints it is to be regretted that we have no suitable text-book on this subject, and yet this very condition will make sure that much material, which in its way is the best in the world, will be utilized and thus enable it to serve the purpose for which it has been produced. Very little literature, I imagine, receives as much study and revision, pruning and correction, as much time spent in attaining to absolute scientific accuracy, as have the circulars issued from the office of the state board of health. They represent the work and experience of a great many years; they have stood the test of actual use in the practical affairs of sanitary science; they have been constantly revised and brought up to date. All of this material is placed at the disposal and for the use of the teachers of Michigan. From it and other sources can he gathered the subject-matter for a successful school course. The subject will, therefore, need to be taught orally, and this is the method contemplated in the law passed by the legislature of 1895. The following is a brief bibliography of these publications with which every school should be provided:

One of the late reports of the Michigan state board of health.

One of the late volumes of the vital statistics issued by the secretary of state.

The latest United States census reports, especially the volumes on vital statistics.

The compiled health law of Michigan.

Various reprints issued by the state board of health and referred to farther on in this paper by number.

Special circulars on each of the leading diseases, published by the state board.

Bulletins 130 and 140 of the Michigan Agricultural College experiment station.

The amount of the instruction given in different schools will vary according to the interest in the subject and the fullness of knowledge possessed by the teacher. Under the present conditions the time will necessarily be somewhat limited, and therefore this paper and the practical suggestions which follow are based on the thought of one exercise per week for twenty weeks. The course here outlined must be understood as a merely tentative one, subject to amendment and modification as experience shall suggest.

My own thought concerning the method of conducting the work is to make it, as far as possible, the result of research work conducted by the pupils themselves. Having access to the authorities cited above, they can be furnished with certain questions which, when the answers have been obtained, will form the basis of a further discussion by teacher and class. A good pedagogical principle, applicable here as elsewhere, will be to tell a pupil nothing which he can find out for himself. But the teacher must know the subject himself.

Lesson 1. The object of this lesson might be to set forth the necessity and the nature of the instruction in sanitary science and at the same time to show the far-reaching results growing out of such instruction. Every subject should have its complete justification for taking the time and attention of our schools,

and this new subject must demonstrate its worth and its right to be.

Consult dictionary and encyclopedia for definitions of sanitary science. It should be remembered, however, that definitions from books which are a decade old will need to be modified so as to contain the thought that the practical application of the principles of sanitary science produces a marked decrease of sickness and the saving of hundreds of human lives; that prevention is the watchword and not cure; that the means of prevention are well known and so simple that they can be understood and put into practice by the common people.

Now let the investigation proceed along the line of the following questions: What is the population of the state? Learn incidentally other interesting facts, such as number of native and foreign-born, number living in cities and in the country, number in the upper and lower peninsula, etc. What number die each year from all causes? What per cent. is this number of the entire population? Stated in another way, this mortality is about how many per thousand of the entire population? How does the statistician classify the causes of death? What per cent. of the total mortality is of most interest to the sanitarian because of the fact that it belongs to the preventable class? What, then, is the sanitary problem to be solved by the united coöperation of all the people of the state of Michigan? These and other facts may easily be obtained by consulting the vital statistics of Michigan. They are summarized in *Education*, January 1897, p. 272.

Lesson 2. This lesson may be of the same nature as the first, but directed more specifically to the statistics of the eight leading diseases which cause the greatest number of deaths in Michigan. Notice that those diseases which cause the most sickness do not necessarily cause most deaths. On this latter point consult reprints No. 425 or 209 of the state board of health. The principal basis of this lesson will be reprint No. 226, and especially the first half of the first page. The diagram[1] there given

[1] In Michigan the most dangerous communicable diseases, named in the order of

was made from figures gathered during the ten years 1884–93, and included in the aggregate for the ten years 54,879 deaths. The diagram may also be taken to represent the relative importance of the given diseases for any one year. Now suppose, which is approximately true, that one thousand people die in Michigan each year from typhoid fever. Notice that the line in the diagram representing the deaths from that disease is just one inch long. How many deaths from scarlet fever? From diphtheria? From consumption? What per cent. is this last number of the total mortality in the state? If one in every eight of deaths, the world over, is from consumption, "the great white plague," how many die each year in the United States? etc., etc. Close the hour with the thought that all this can be prevented when the people as a whole learn how to coöperate with this end in view.

Lesson 3. An elementary lesson in bacteriology.—One lesson should be devoted to giving elementary ideas concerning the relations which germs or bacteria bear to disease and death. Look up definitions of disease; notice the etymology of the word disease, *dis-ease*. Give the pupils some general idea as to how germs are handled, how they are grown, what is meant by pure cultures, how they are identified, how the relation of a specific micro-organism to a specific disease is established, etc. For this lesson, Professor Marshall's papers, Bulletins Nos. 139 and

their importance as causes of death, are consumption, pneumonia, influenza, diphtheria, typhoid fever, scarlet fever, measles, whooping-cough, and smallpox.

The relative importance of these diseases is shown by the diagram below. Consumption causes many more deaths than does any other disease.

DEATHS IN MICHIGAN, 10 YEARS, 1884–93.

Consumption

Pneumonia.

Diphtheria.

Typhoid fever.

Scarlet fever.

Measles.

Whooping-cough.

Smallpox.

140, issued by the Agricultural College experiment station, are very valuable.

Lesson 4. Health administration and health laws.—How are the sanitary forces organized by which the work of sanitary reform is to be carried on? The state board of health, its membership, how selected, term of office, salaries, executive officer and his duties; the threefold nature of their work, to collect information, to collate and study this information, to spread the knowledge thus obtained among the people; their relation to the state advisory rather than mandatory. Local boards of health, in townships and cities, organization, duties, responsibilities, relation to state board, must appoint a health officer. The health officer and his powers and responsibilities; physicians and their legal relation to communicable diseases. Lastly and most important of all, the people and their duties and responsibilities under the law. Reprints Nos. 297, 120, and 425 will be helpful for this lesson.

Lesson 5. Means of prevention.—This lesson will deal with the two means which are constantly in use, namely: Isolation and disinfection. Place emphasis on the fact that these means are worthless, or at least they count for very little, unless they are most thoroughly carried out. For example, to burn a little sulphur in the sick room is not disinfection; but the directions must be followed and at least three pounds of sulphur burned for each thousand cubic feet of air space. Isolation is not thoroughly practiced if the mother or the nurse, the cat or the dog, or anything is allowed to pass from the sick to the well or from the room in which the sick are to that part of the home occupied by the well. Study the special circulars on diphtheria and scarlet fever for specific directions concerning isolation and disinfection.

Lesson 6. Life saving.—From my standpoint of experience it will pay to spend at least one exercise hour in making the proof that the efforts which are being made do actually result in the warding off of much sickness and the prevention of many untimely deaths. Study the facts which can be gleaned from

Plate No. 547: "Isolation and Disinfection Prevent Scarlet Fever." The conclusions shown in this diagram are perfectly reliable, having been drawn from statistics gathered with the greatest care. The word "outbreak" as used on this diagram perhaps needs definition: For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. Heretofore, when a period of sixty days or over has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak has been considered ended. In order to study the subject systematically there must be a limit in time, as also in area.

With this diagram before the pupil, let him answer such questions as: How much time is involved in the facts represented? What is the total number of outbreaks? In how many outbreaks was it reported that isolation and disinfection were enforced? How many reports show that these means were neglected? In the former cases, how many persons sick, on the average, per outbreak? How many deaths? Total cases of sickness for the 361 outbreaks? What is shown by a comparison of the average number of cases of sickness when isolation and disinfection were enforced and when neglected? What would have been the total number of cases of sickness if in all the 1857 outbreaks these means had been (*a*) neglected and (*b*) enforced? What is the lesson learned from the comparison of the numbers? Make similar comparisons for the relative number of deaths. Compute the total annual doctor's bill for the state for the sickness from this one disease, supposing that the average period of sickness from scarlet fever is four weeks and the doc-

tor's daily calls at the rate of one dollar a visit. Compute the undertaker's bills and funeral expenses at the rate of $50 per death.

Close this lesson with the thought that four-fifths, perhaps, of all this can and ought to be prevented, and will be prevented when all have learned to practice the rules of sanitary science. It would do no harm to turn this lesson into one on social science and enforce the truth that one of the great factors, if not the greatest, which produces poverty and distress in this country is disease, with its loss of productive labor and its great debt which must be paid to the physician and the undertaker.

Lessons 7 to 13, inclusive, may be detailed studies of each of the leading communicable diseases. One disease should be studied at a time, the facts being gathered from the special circulars prepared in and sent out by he state board of health. These may be enlarged upon by researches in any authorities which may be accessible. When several have been studied, or during the course of these lessons, constant comparisons should be made of these diseases with each other, noting their likenesses and differences.

These lessons should cover the questions of the specific causes of the disease, part of the body affected, premonitory symptoms, period of incubation, mode of spread, and methods of prevention. In this way consumption, diphtheria, typhoid fever, measles, whooping cough, and smallpox should be carefully studied.

In connection with the study of typhoid fever the question of water supply may receive attention, especially the relation which the well sustains to the receptacles for infected excreta and the method by which the typhoid germs make their circuitous, but certain way, from the body of the sick to that of the well.

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